A STUDY OF MURMURS IN PULMONARY TUBERCULOSIS.

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Two things in particular prompted the present study in regard to murmurs: (1) Their frequency and wide distribution in pulmonary tuberculosis, especially in far advanced cases; and (2) the difficulties in diagnosis they may occasion. The clinical records in a number of cases of pulmonary tuberculosis have been investigated in regard to murmurs, and the results tabulated. The term murmur has been used in the restricted sense of a sound possessing more or less of a blowing or whiff-like character, and not in the comprehensive sense, which "includes all those adventitious acoustic phenomena connected in some way with the heart's action, and not resembling in tone the normal cardiac sounds" (Babcock).

The cases have been divided into two groups: (1) Those in which there is some gross lesion of the heart or bloodvessels—for instance, endocarditis or myocarditis; and (2) those without any such lesion definitely diagnosticated, and usually without any clearly defined cause. The second group will be considered first. All cases are to be understood as belonging to this second group except when the contrary is specifically stated.

Murmurs independent of demonstrable changes in the heart or bloodvessels occurring in tuberculosis have received attention from time to time since Stokes described a murmur in the subclavian artery. Some authors, for instance, Walshe, Wilson Fox, and Samuel West, devote a small space to these murmurs; others, as Cornet, barely refer to them. From the opinions expressed one concludes that murmurs of this sort are not limited to tuberculosis, in fact, may occur in normal individuals; that they are heard rather infrequently; that they are apt to be temporary and to be modified by the phases of respiration; and that their causes cannot be definitely determined. These murmurs are usually described as occurring most frequently at the base of the heart or in the subclavicular regions, less often at the apex, over the back, and elsewhere.

Uniform statistics on the frequency and distribution of murmurs are not to be expected because of the variable factors on which murmurs often depend. Some of these factors are exertion, sudden or protracted, the position of the patient, the character of the breathing, the stage of the disease, the frequency of examination, the quietness of the examining room (a very important factor in hearing the fainter murmurs), the natural acuity and the training of the examiner's ear, and the degree of concentration employed in ausculting. Statistics on the frequency of murmurs in pulmonary tuberculosis are available from comparatively few sources. At the Henry Phipps Institute[1] functional murmurs occurred in 3.4 per cent. of 2078 cases, distributed as follows: Systolic at the mitral area, 36 (1.73 per cent.), and systolic at the pulmonic area, 35 (1.67 per cent.). At the Adirondack Cottage Sanitarium,[2] where most of the cases are not far advanced, functional murmurs occurred in 6 per cent. of 1289 cases. These murmurs were divided about equally between the base (chiefly the pulmonic area) and the apex.

The occurrence of murmurs over the chest was investigated in 80 cases of pulmonary tuberculosis, in which it was impossible to ascribe the cause to any gross cardiac or vascular disease. The great majority were females—63, in contrast to 17 males. There was 1 case under ten years of age, there were 9 cases between ten and twenty years, 38 between twenty and thirty years, 18 between thirty and forty years, 7 between forty and fifty years, and 7 cases were over fifty years of age. In other words, there was nothing specially interesting about their ages. Most of the cases were far advanced—61, in contrast to 9 incipient and 10 moderately advanced cases. Examinations were made repeatedly in most of the cases, and were usually conducted in an absolutely quiet room.

Frequency and Distribution of Thoracic Murmurs in 80 Cases (Not Due to Demonstrable Cardiac or Vascular Disease).

	Cases.
Murmurs present	56
Both anteriorly and posteriorly	25
Anteriorly	22
Posteriorly	9
Murmurs anteriorly	43
Both sides	17
Right side	7
Left side	19
Murmurs on the right side, anteriorly	23
Both above and below third rib	12
Above third rib	8
Below third rib	3
Murmurs on the left side, anteriorly	36
Both above and below third rib	21
Above third rib	6
Below third rib	9
Murmurs in the axilla	10
Both axillæ	1
Right axilla	4
Left axilla	5
Murmurs posteriorly	34
Both sides	8
Right side	11
Left side	15

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[1] Henry Phipps Institute, Fifth Annual Report.

[2] Lawrason Brown, Amer. Jour. Med. Sci., December, 1908.

The Frequency and Distribution of the Murmurs. Murmurs were audible over the chest in 56 of these 80 cases. According to the stage of the disease, murmurs were present in 3 of the 9 incipient cases, 8 of the 10 moderately advanced cases, and 45 of the 61 far advanced cases. Murmurs were audible both anteriorly and posteriorly in 25 cases, anteriorly alone in 22 cases, posteriorly alone in 9 cases. Anteriorly, murmurs were present on both sides of the chest in 17 cases, on the right side alone in 7 cases, and on the left side alone in 19 cases. Over the sternum, murmurs were recorded in 24 cases. On the right side of the chest, in front, murmurs were present both above and below the third rib in 12 cases, only above the third rib in 8, and below in 3 cases. On the left side, in front, murmurs occurred both above and below the third rib in 21 cases, only above the third rib in 6, and below the third rib in 9 cases. Murmurs anteriorly were audible in the different interspaces in the following number of cases:

	Right side. Cases.	Left side. Cases.	Sternum. Cases.
First interspace	10	12	5
Second interspace	20	26	13
Third interspace	13	20	14
Fourth interspace	7	19	12
Fifth interspace	5	18	9
Below fifth interspace	1	1	2
Not stated	0	0	1

Posteriorly, murmurs were present on both sides in 8 cases, on the right side alone in 11 cases, on the left side alone in 15 cases. Murmurs were heard in both axillæ in 1 case, in the right axilla alone in 4 cases, and in the left axilla alone in 5 cases. In all the cases in which the murmur was audible in the axilla one could also be heard in some other part of the chest, and usually the axillary murmurs were topographically continuous with those audible elsewhere.

For practical purposes, many of the murmurs may be advantageously classified according to limited areas over which they are heard with the greatest intensity; for example, the base of the heart, the region of the apex, the region of the angle of the scapula, etc. Some murmurs, however, do not have any very limited area of maximum intensity.

In my experience, murmurs over the front of the chest occur most frequently at the base. They are generally heard in the second interspace, more often in the left than the right, or at the same level over the sternum. Laterally, they usually extend only a short distance from the sternum, particularly on the right side. Murmurs at the base may have a wider distribution, but under these circumstances it is often difficult to determine whether we are dealing with two or more murmurs running together or overlapping. In 37 of the 80 cases a murmur was audible in the right or left second interspace, or at a corresponding level over the sternum, most of these covering quite limited areas.

Murmurs were heard about half as often at the apex as at the base. Their maximum intensity was at, or a little inside, the cardiac apex, usually in the fifth interspace, between the parasternal and midclavicular lines; less often in the fourth interspace. They were rarely transmitted beyond the anterior axillary line, even when they seemed pretty clearly due to mitral regurgitation (mitral regurgitation not dependent on gross cardiac disease). In 4 of these cases the situation, transmission, loudness, and persistency of these murmurs seemed to indicate leakage at the mitral valve.

Systolic murmurs over the sternum, below the level of the fourth rib, occurred in 13 cases. They were usually faint, and sometimes were transmitted from other regions. Sufficient evidences on which to base a diagnosis of tricuspid regurgitation, particularly the presence of a positive venous pulse, were lacking in all the cases. In only 1 case was anything heard suggestive of the xiphosternal crunching sound.

The murmurs on the left side, anteriorly, covered larger areas, as a rule, than those on the right side. Out of 36 cases with murmurs on the left side, the murmurs were limited to a single interspace (usually the second or the fifth) in 13 cases, to two interspaces in 6 cases, to three interspaces in 5 cases, to four interspaces in 5 cases, to five interspaces in 6 cases, and to six interspaces in 1 case. In no case was a murmur limited to the axilla. Apical murmurs were transmitted to the axilla in 3 out of 6 cases with axillary murmurs.

Posteriorly, murmurs were recorded in 34 of the 80 cases, eight times on both sides, eleven times on the right side alone, and fifteen times on the left side alone. A murmur may be heard over a very limited area or over the whole of the back of the chest. While the latter is rare, it is common to find a murmur covering a considerable portion of one or both sides of the back. But in nearly every case, irrespective of the extent of the murmur, an area of maximum intensity will be found at or near the angle of the scapula, close to the angle of the scapula or below it, or inside it, or over the lower portion of the interscapular region. In only 1 case were two points of special intensification recorded on one side, posteriorly—a case in which the murmur was audible all over the left side, posteriorly, but specially marked above the spine of the scapula and at the angle of the scapula.

Murmurs may occur over very limited or over extensive areas. In 1 incipient case a murmur could at times be heard over nearly the entire chest. Murmurs entirely distinct from one another may be heard in different parts of the chest in the same individual as at the base and at the apex, or may blend together and prevent outlining the exact limits of a murmur.

Only murmurs over the chest have been referred to. Adventitious sounds above the clavicles are not infrequent in tuberculosis; sometimes they are murmurs of a blowing or whiff-like character, but more often only a roaring, humming, or rumbling sound is heard.

TIME OF THE MURMURS. Systolic murmurs were present in all of these 56 cases. It was sometimes impossible to tell with absolute certainty the time of the murmurs over the back of the chest. Out of the 56 cases, a diastolic murmur was recorded in only 4, and in 2 of these cases only once after several examinations. All the diastolic murmurs were associated with systolic murmurs, and were of the same character. In 3 of the cases the murmur occurred over some part of the sternum and the left side adjacent, and in 1 the murmur was audible on the right side from the second to the fifth interspace, inclusive, and from the sternum to the midclavicular line, and very faintly for a short distance beyond. The last occurred only on inspiration. In 1 of these cases at one examination there could at times be heard a faint diastolic murmur in the left interscapular region. In 3 of the cases the murmur was rough. In all the cases the second aortic sound was, at least at times, accentuated.

In a case not included in the above series a very extensive diastolic murmur, not dependent on any demonstrable cardiac or vascular disease, was encountered in a woman, aged twenty-eight years, with extensive left-sided pulmonary and pleural involvement; the heart being apparently slightly retracted upward and to the left. Her hemoglobin was 80 per cent. The diastolic murmur was audible over the sternum from the second interspace to the sixth rib, and extended beyond the left midclavicular line, reaching the anterior axillary line at the level of the fifth rib. The maximum intensity was in the third interspace, at the parasternal line. There was also audible a systolic murmur over a part of this area and over a part of the right side. The time and distribution of murmurs varied on different occasions.

INTENSITY OF THE MURMURS. Faint murmurs were described in 33 out of 48 cases in which the intensity of the murmurs was mentioned. Sometimes they were very faint, an occasional one being audible only with a Bowles stethoscope. In 1 case, a murmur could be heard with an ordinary stethoscope and not with the Bowles. To hear some of these murmurs, absolute quiet in the room and concentrated attention were necessary. In some patients murmurs could be heard on only one of several examinations, and sometimes specially favorable circumstances, as a certain position of the patient, excitement, exertion, etc., were required.

In 15 cases a murmur was described as distinct, fairly loud, loud, or marked. In 4 cases there was quite a marked systolic murmur at the apex. The base, the apex, and the regions of the angles of the scapulæ were the most common seats of the louder murmurs and of the maximum intensity of murmurs of wide distribution.

Fairly loud murmurs, as a rule, covered only small areas, but were more apt to be extensive posteriorly than anteriorly. Various factors, like exertion, that may produce murmurs, may also increase their intensity. The different phases of the respiratory act may have quite a marked effect on the loudness of a murmur. Like murmurs due to endocarditis, these murmurs may vary greatly at different examinations.

LENGTH OR DURATION OF THE MURMURS. The length of the murmurs was shorter than often occurs with murmurs due to other causes, like endocarditis, but the rate of the heart was nearly always increased. The only case in which a fairly prolonged murmur was recorded was an incipient case, with a normal heart rate.

THE QUALITY OF THE MURMURS. The murmurs were generally soft and blowing in character, sometimes being heard as very faint whiffs. Occasionally a slightly ringing quality was audible. In only 3 cases was a rough murmur recorded, in 2 cases the roughness affecting both the systolic and the diastolic murmurs. Rough murmurs were audible only anteriorly.

While murmurs in advanced cases may vary from time to time in loudness, extent, etc., they usually do not entirely disappear, and when they do it is generally only temporarily. This persistency we have noticed especially in regard to murmurs at the apex and over the back.

RELATION TO RESPIRATION. In 36 cases the relations of the murmur to inspiration, expiration, and the respiratory pause were recorded. While most of the murmurs could be heard during all parts of the respiratory act, they were usually louder at one portion than at another. The commonest time for diminution or cessation of murmurs was during inspiration, except at the very end of inspiration. In 10 cases the murmur was inaudible during inspiration. In but 1 case a murmur was stated to have been heard during inspiration only. When murmurs were modified by respiration the greatest intensity usually took place during expiration, or during expiration and the respiratory pause, sometimes at the end of inspiration and beginning of expiration.

The effect of holding the breath was recorded in 16 cases with murmurs. In only 2 cases did the murmur disappear when breathing was suspended. As a rule, the murmurs were heard equally as plainly when the breath was held as during the act of respiration. In 2 cases a murmur could only be heard when breathing was suspended; in 1 of these cases only after expiration. Occasionally a murmur would weaken after the breath had been held for some time.

The relative weakness or absence of murmurs during inspiration in many of the cases, I believe, was often due to the loudness and sometimes to the exaggeration of inspiration. Inspiration is normally louder than expiration, and is apt to become intensified over healthy tissue when such tissue is reduced in amount. Thus, murmurs are apt to be heard over one base at the back when the opposite side is extensively infiltrated, and the loudness of inspiration under such circumstances is quite sufficient to obscure a faint murmur.

In only 3 cases did the character of the murmurs suggest that they might be due to the passage of air through normal or abnormal channels, instead of their being circulatory in origin. Such murmurs may have been caused oftener, but we could not demonstrate this. Rarely distinct respiratory puffs, synchronous with the heart beat, occurred. Occasionally it may be difficult to distinguish between a murmur and a rale.

RELATION TO BODILY POSITION. Most of the 80 cases were examined in a sitting position during the ordinary routine chest examination, but a small proportion were also auscultated while standing or while lying down. Occasionally the position of a patient modified the murmur, but it was generally less the position than the attending exertion that seemed responsible for the modification. In advanced tuberculosis it takes very little effort to cause or to modify murmurs. Sometimes one position will reveal a faint murmur; the same position later, after the patient has been listened to in various other positions, may reveal a much louder murmur. Or the reverse result may be observed. For instance, a murmur audible just after a patient takes his seat, may disappear after this position has been maintained for some time. With the murmurs at the apex, the sitting position was more apt to be associated with the presence of a murmur or its intensification than the horizontal position. Very few records were made of examinations with the patients in the right or left lateral positions.

RELATION OF MURMURS TO THE KIND OF UNDERLYING LUNG TISSUE, WHETHER HEALTHY OR DISEASED. In advanced tuberculosis, murmurs are usually louder or more widespread, and occur oftener over the functionating lung tissue than over the diseased portions, with the possible exception of the left side in front. Thus, in 10 cases with a murmur on the left side posteriorly, and none on the right, there was considerable healthy tissue on the left side, especially at the base, and much less or none at all on the right side. Likewise, in 8 cases with a murmur at the right base posteriorly, more healthy tissue was found here than at the corresponding situation on the left side. In a boy, aged two years, a murmur was audible over the right back when the left side was extensively diseased. Murmurs were also more frequent over the right side, in front, when the tissue here was healthy than when it was diseased. When there was not much lung involvement on either side, however, murmurs were more frequent or were louder or more widespread at the left base posteriorly, than at the right, in our cases in the proportion of 6 cases on the left to 1 case on the right—an occurrence not peculiar to tuberculosis.

ETIOLOGY. The attempt to determine the causes of these murmurs in any given case is usually met with great difficulties. Any factor proposed to explain their occurrence will often be wanting in cases with murmurs, or may be present even when murmurs are absent. Even in cases in which murmurs can be produced artificially, for instance, through exertion, one can, as a rule, only venture an opinion as to their complete etiology. The subject is further complicated by the occurrence of murmurs in apparently normal individuals.

Murmurs associated with tuberculosis and with other forms of marked debility probably often depend on similar causes, the exact nature of which, however, is usually obscure. The determining cause in some of the cases is doubtless contraction or imperfect expansion of the great vessels, resulting from adhesions, enlarged glands, pulmonary consolidation, displacement of the heart, and an enlarged heart pressing on bloodvessels. According to Thayer and MacCallum,[3] only very slight pressure over the pulmonary artery or conus arteriosus, in dogs, results in the development of a systolic thrill and murmur immediately beyond the point of pressure. If murmurs in the pulmonary artery are produced as easily, relatively, in man as in dogs, traction or pressure upon this vessel may readily explain some of the murmurs audible at the base of the heart. Some of the murmurs may be ascribed to roughening of the aorta or to slight roughening or thickening of the valves of the heart. The frequency of the latter condition is shown by the figures of Norris,[4] who found endocardial thickening in 15 per cent. of 1764 autopsies on tuberculous patients, the proportion of valvular involvement being: mitral, 183; aortic, 126; tricuspid, 23; and pulmonary, 13. A congenitally small aorta, said to be not infrequent in tuberculosis, suggests a possible cause for some of the murmurs. West considers that the murmurs at the angle of the scapula may often be due to air being forced out of lung tissue by the cardiac pulsations. It seems possible that murmurs audible over a large part of one healthy lung when the opposite lung is extensively involved may be due to circulatory changes in the pulmonary artery on the unaffected side. The marked persistent murmurs at or near the apex are probably quite often due to leakage at the mitral valve, the result of weakness of the mitral sphincter or the papillary muscles. Similar conditions affecting the tricuspid valve may cause some of the murmurs heard in the lower sternal region. A moderate oligochromemia occurs frequently in tuberculosis, not oftener, however, in cases with murmurs than in those without. We have been unable to demonstrate any constant relationship between the transmission of murmurs and pulmonary consolidation near their seat of origin. In many cases on such relationship exists, and in some, especially those with murmurs situated posteriorly, consolidation seems to interfere with their transmission. The proportion of cases with murmurs increases with the advance in the disease, and for their explanation one naturally looks to the conditions peculiar to advanced cases, particularly as they affect the circulatory system. Some of these conditions are quite constant, for instance, an increase in the pulse rate and a fall in blood pressure; others are more variable, like the strength of the heart beat. But it is impossible to find any relationship between these circulatory conditions and the occurrence of murmurs constant enough to warrant definite conclusions as to causation; and, least of all, is it possible to demonstrate any etiological relationship in individual cases. It is not surprising that slight exertion or excitement produces or modifies murmurs in weak advanced cases in which various circulatory factors, for instance, the rate of the heart, are so easily upset by even trivial causes.

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[3] AMER. JOUR. MED. SCI., February, 1907.

[4] Ibid., October, 1904.

In the maze of questions brought up by this subject one would fain take comfort in what has been said by Sahli, that the difficult problem is not to explain why murmurs do sometimes occur, but rather why, with all the conditions apparently favorable for their production, they do not always occur.

DIAGNOSIS. A diagnosis as to whether a murmur is due to endocarditis or to other causes may be made very difficult, even impossible, by the presence of advanced pulmonary tuberculosis. Such difficulties have been most frequently occasioned, in our experience, by systolic murmurs at the apex. With these apical murmurs we have to determine whether mitral regurgitation is present or absent, and, if regurgitation is present, to determine whether it is due to endocarditis or not.

In advanced cases of pulmonary tuberculosis with presumable cardiac weakness, fairly loud systolic murmurs at or near the apex, transmitted toward the axilla, and heard repeatedly over a considerable length of time, may, in the majority of cases, be strongly suspected of being due to leakage at the mitral valve. These murmurs are usually only faintly transmitted beyond the midclavicular line, and are rarely audible in the axilla. They are unaccompanied by demonstrable enlargement of the heart, or by any apparent general effect, and are interesting chiefly for the uncertainty in diagnosis they may occasion.

Difficulty in determining whether a murmur, supposedly due to mitral regurgitation, occurring in advanced pulmonary tuberculosis, is due to endocarditis or not may arise because tuberculosis and heart disease have so many manifestations in common. Cyanosis, dyspnœa, curving of the nails, accentuation of the second sound at the pulmonary cartilage, a murmur at the angle of the scapula, are common in both heart disease and pulmonary tuberculosis. The effect of position on the murmur has been too variable, in our experience, to be of much real help. The all-important evidence, that a mitral regurgitant murmur is due to endocarditis, namely, enlargement of the heart, may be difficult to obtain in tuberculosis because of the difficulty to locate the position of the apex, and to determine the cardiac outlines by percussion. Uncertainty as to the location of the apex may be due to a very feeble apex beat, or to a diffuse one dependent on an overacting heart. The location of the apex and the percussion outlines may give unreliable information, on account of the presence of compensatory emphysema, retraction of the lung, consolidation adjacent to the heart, and cardiac displacement. However, when the heart is drawn to the left, the maximum apex impulse is frequently in the fourth interspace, and in no case do we recall a maximum apex impulse to have occurred downward (sixth or seventh interspace) and outward in a heart itself normal.

A definite history of acute articular rheumatism furnishes corroborative evidence in favor of endocarditis, while a history simply of rheumatic pains is of little value, as they occur so frequently in tuberculosis.

With the appearance of failing compensation the peculiar features of this condition should be sought for, as they are apt to furnish quite a contrast to what is encountered in tuberculosis. Marked pulsation and dilatation of the cervical vessels is common in the later stages of heart disease, but is uncommon even in advanced tuberculosis, except for the prominence of the veins that may be seen during the act of violent coughing. Cyanosis is often more pronounced in failing compensation than in advanced tuberculosis. Pulsation from an enlarged liver is frequently met with in the final stages of failing compensation, an unknown occurrence, in our experience, in uncomplicated tuberculosis. On account of the great rarity of the typical evidences of failing compensation in cases very far advanced in tuberculosis, if, indeed, they ever appear under these circumstances, their occurrence furnishes evidence of the strongest kind in favor of the presence of some causative condition in no way associated with tuberculosis.

Myocarditis due to valvular disease and various causes of a non-tuberculous nature often exhibits certain features that are uncommon in cases of tuberculosis even when they are advanced. Thus, marked irregularities may occur within a short period in the force of the heart beats, or in the duration of individual cardiac cycles. A typical example is a case in which the heart beats weaken at irregular intervals, and are accompanied by a corresponding intermission of the pulse. Another example is found in cases with delirium cordis. These abnormalities, moreover, do not necessarily follow any regular sequence or depend on any temporary or removable cause. In tuberculosis, on the other hand, the irregularities are apt to be limited to variations in rate, or to the interpolation of additional sounds, such as occur in reduplications, the cardiac rhythm, as a whole, not being affected. Sudden and marked variations in rate are frequently met with in tuberculosis, but are often due to some temporary cause, like excitement, and disappear on its removal. In tuberculosis abnormal cardiac sounds are common, but the length of individual cardiac cycles and the force of the heart beats only rarely show marked and irregular variations. When these variations do occur they often depend on some temporary and removable cause. We refer, of course, to sounds during a limited time, for instance, during one examination, and not to variations that may occur from day to day or from week to week.

Other murmurs due to endocarditis or to congenital cardiac defects seem of less practical importance diagnostically than the mitral regurgitant murmurs, either because of their infrequency or because of the greater readiness with which a diagnosis may usually be made. Unlike mitral regurgitation, the other common forms of valvular disease, mitral stenosis, and aortic regurgitation have certain distinctive features, the former especially the peculiarity of the thrill and murmur, and the latter especially the evidences outside of the heart. Moreover, these features are not likely to be obscured by the associated tuberculosis.

Endocarditis was recorded in 0.9 per cent. of 71,000 cases of pulmonary tuberculosis collected by Lawrason Brown.[5] A positive diagnosis of endocarditis was made in 2 cases, and a probable diagnosis of endocarditis in 1 case, out of 171 consecutive cases of pulmonary tuberculosis at the Home for Consumptives at Chestnut Hill. There were 32 incipient, 44 moderately advanced, and 95 far advanced cases; 41 were males and 130 were females. Doubtful cases were examined repeatedly over considerable periods of time. No cases of pericarditis, of congenital cardiac defect, or of vascular disease other than arteriosclerosis were diagnosticated in this group of cases. Myocarditis was strongly suspected in a number of cases, particularly advanced ones, but I must admit that we have rarely been able to furnish scientific evidence of this condition in uncomplicated tuberculosis.

CASE I.—This patient is a young woman, aged twenty-seven years, single. Her occupation has been ordinary housework. At twelve years of age she had pneumonia, and since then her health has never been completely restored. At fifteen she had rheumatic pains in all her limbs. At sixteen she had measles, and the same year developed an anal fistula. At nineteen she had typhoid-fever and pleurisy: the latter recurred several times later. The duration of the tuberculosis is considered to have been between eight and fifteen years. Her height is five feet one and a half inches, and her weight

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[5] AMER. JOUR. MED. SCI., February, 1909.

110 pounds. The sputum contained tubercle bacilli on the last examination. The urine contains no albumin. The hemoglobin is 75 per cent. The diagnosis of the pulmonary condition is arrested incipient tuberculosis.

Heart. The apex beat is usually diffuse, reaching beyond the left midclavicular line in the fourth and fifth interspaces. A presystolic thrill is usually present at the apex. Deep percussion gives dulness above at the second rib, on the right at the right border of the sternum, and on the left a short distance beyond the midclavicular line. The second pulmonic sound is at times accentuated. There is always present a prolonged presystolic sound, usually a rumble, sometimes a whiff-like murmur, over an area varying in size in the fourth and fifth left interspaces near or at the apex. Less often, there is a systolic murmur in the region of the apex, sometimes reaching as far as the anterior axillary line, promoted more by exertion than by position. The patient enjoys moderate, though not vigorous, health, except for occasional attacks of gastric disturbance, accompanied with marked palpitation and dyspnœa. At these times there may be marked arrhythmia of the heart, even a mild grade of delirium cordis, suggesting myocarditis, though, ordinarily, compensation is fairly well maintained.

Diagnosis. Endocarditis of the mitral valve, with mitral stenosis and, to a less extent, mitral regurgitation; moderate cardiac hypertrophy.

CASE II.—M. C., female, aged fifteen years, single, has been attending school irregularly. She had a typical attack of acute articular rheumatism at six, and has never been as well since. Her history of tuberculosis dates back seven years, when she had an attack of pleurisy. She is five feet in height and weighs 90 pounds. There is no albumin in the urine, the hemoglobin is 88 per cent. The most extensive involvement is on the left side. While this is a far advanced case, the patient is steadily improving, and leads a pretty active life.

Heart. The apex beat is diffuse, the most marked impulse being in the left midclavicular line, in the fifth interspace. There are no thrills. The upper border of cardiac dulness is at the third rib, the right border at the right border of the sternum, and the left border a short distance beyond the midclavicular line in both the sitting and horizontal positions. The pulmonic second sound is accentuated. When the patient is sitting there is a constant, distinct, fairly loud, blowing systolic murmur, most marked in the fifth interspace at the midclavicular line, transmitted into the left axilla, audible to the right as far as the parasternal line, and disappearing above at the junction of the latter with the third rib. It is much fainter in the horizontal position. Faint systolic murmurs are audible at the inferior angle of the scapulæ, the more marked one on the left side.

Diagnosis. Endocarditis of the mitral valve, with mitral regurgitation; moderate cardiac hypertrophy; compensation good.

CASE III.—J. F. B., male, aged forty years, married, travelling salesman by occuaption, had nothing of importance in his family history, except that his maternal aunt had died twenty-five years before of consumption. He had scarlet fever at seven, but gave no history of rheumatism. His mother states that he began to have "spells," accompanied with unconsciousness, at twelve, and that he has always been a little odd. He stated that he had a heart attack at twenty, and that occasional attacks of fainting had occurred since. For a number of years he had been subject to copious hemorrhages from the bowels, and he had suffered from stomach trouble. Five months before admission he had had a violent cold, something like whooping cough, accompanied with severe dyspnœa, which had never left him. The duration of the tuberculosis had apparently been at least five months. His height was five feet six and one-half inches. His weight was 129 pounds, only 10 pounds loss in the previous five months, though twelve years previously he had weighed 154 pounds. The sputum showed tubercle bacilli before admission, none on two examinations subsequently. The urine showed a trace of albumin, many casts, which later increased in number; red cells also appeared later. Hemoglobin, 90 per cent. There was marked cyanosis, and the dyspnœa, with air hunger, was so severe that he could hardly rest at all at night. There was marked pulsation of the cervical vessels. There was enlargement of the liver and œdema of the lower extremities, which later increased. The extent of the tuberculosis in the chest was difficult to determine, but apparently this was a moderately advanced case.

Heart. There was a distinct heaving impulse in the fifth and sixth left interspaces, reaching in the latter situation nearly to the anterior axillary line. There was no thrill, but an uncertain presystolic impulse. The heart extended upward to the upper border of the third rib; on the right, a finger's breadth beyond the right border of the sternum; and to the left, nearly to the anterior axillary line. A systolic murmur was audible in the fifth and sixth left interspaces, from the sternum into the axilla, being most marked in the sixth interspace beyond the midclavicular line, in which location it was quite loud. It entirely disappeared before death. The first sound at the apex was weak and muffled and of very poor muscular quality. For a time it was almost entirely replaced by the murmur. Sometimes a long presystolic rumble was audible at the apex. The pulmonic second and aortic second sounds were never accentuated. Posteriorly, a systolic murmur was heard below the left scapula. The cardiac rhythm was usually fairly well preserved; at least, the individual cardiac cycles did not show much variation. The patient died at the end of seventeen days. The diagnosis of the heart lesion was probable endocarditis of the mitral valve, mitral regurgitation, cardiac hypertrophy, myocarditis, and failing compensation. It was impossible, however, to exclude as the cause of the regurgitant murmur myocarditis in a heart hypertrophied in consequence of an antecedent nephritis.

SUMMARY. Murmurs over the chest not demonstrably dependent on cardiac or vascular disease, when listened for carefully, under favorable circumstances and repeated examinations, are found frequently in tuberculosis. They were heard in nearly three-fourths of our advanced cases. These murmurs are usually systolic in time and faint in intensity, in our cases three-fourths being faint. They are generally soft and whiff-like in character, though they may be quite loud and harsh. In the majority of cases these murmurs are heard repeatedly, and usually intermit only temporarily. The areas where they are most commonly heard, and where their maximum intensity most often occurs, are at the base of the heart, chiefly to the left of the median line, at the cardiac apex (a little over half as often as at the base), and at the inferior scapular angles posteriorly, more often on the left side. These murmurs are more frequent over the front of the chest than the back; they are more frequent and more widely distributed over the left side in front than the right. They are heard in a relatively small number of cases in the axillæ. They may be very limited in extent or may cover nearly the entire chest. In our cases the murmurs were usually heard best during the quietest part of the respiratory act, that is, during expiration or the respiratory pause, and during suspended respiration; less often they were limited to the end of inspiration and beginning of expiration, and rarely they were heard during inspiration only. These murmurs are modified at times by position, more often by excitement and exertion. With the possible exception of the left side in front, murmurs in advanced cases are heard more frequently over normal or hyperfunctionating tissue than diseased tissue, this being particularly noticeable at the bases posteriorly. The etiology of these murmurs is usually obscure, and causes probably responsible in a certain proportion of all cases are hard to establish in individual cases. In about 7 per cent. of our cases with murmurs, mitral regurgitation dependent on weakness of the heart muscle was diagnosticated. For prognosis and treatment, little is gained from these murmurs of undetermined origin. Even when they seem to depend on the advance of the tuberculous process they furnish little information unobtainable in other ways.

The diagnosis between cases with murmurs due to gross cardiac disease and those without any such cause demonstrable may be rendered very difficult in the presence of pulmonary tuberculosis, especially if it is far advanced. Tuberculosis has many symptoms found in heart disease, and often renders the physical signs of the heart inconclusive, in particular making the size of the heart difficult to determine. The apical murmurs, in our experience, most frequently occasion uncertainty in diagnosis.

Out of 171 cases of pulmonary tuberculosis (over one-half being far advanced cases, and nearly three-fourths being females), a diagnosis of endocarditis was made in 2 cases (mitral regurgitation once, and mitral regurgitation and stenosis once), and a diagnosis of probable endocarditis (mitral regurgitation) was made in a third case. That is, endocarditis was diagnosticated in 2 or 3 of 171 cases. In none of these cases was a diagnosis of disease of the pericardium or of the aorta made. Myocarditis is not infrequently demonstrated microscopically in hearts from persons dying of tuberculosis, and its occurrence is often suggested clinically. The diagnosis, however, in individual cases of tuberculosis is usually very difficult, first, because of the frequent absence of important signs, for instance, certain types of arrhythmia; and, second, because many of the symptoms of myocarditis may also be produced by tuberculosis. Heart disease with failing compensation I have never met in very far advanced tuberculosis.

TWO CASES OF SOLITARY FALSE NEUROMA—PROBABLY NON-MALIGNANT.

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From time to time there are reported cases of solitary tumors developing in nerves. Most of them are of small size and are composed of fibrous tissue. Sometimes the nerve fibers are easily separated from the tumor. At other times they form an integral part of its substance or are lost in the tissue of which the tumor is composed.

Within a year it has been my fortune to operate upon two patients suffering from a serious form of fibrous tumor affecting the nerves. As such condition is not adequately described in any one of a dozen well-known text-books on surgery and pathology which I have consulted, the details of these two cases seem worth recording.

Case I.—The first patient, M. S., came to me from Dr. Tukey, of Bridgeport, and Dr. Dougal Bissell, of New York. He was a young man, aged seventeen years, with an excellent family and personal history. Two years previous to my first examination he fell on the sidewalk while running, and struck his head so that he was unconscious for nine hours. His right shoulder and left leg were badly bruised. In two weeks all symptoms had disappeared. Fourteen months after this accident there was noticed a swelling of the back of the left leg. This increased for about a year, and, according to his parents, it remained stationary afterward. There was absolutely no pain nor any disability. He had grown rapidly—gaining twenty-five pounds in six months.

Physical examination of the patient, made February 7, 1909, showed him to be an unusually well-developed young man, five feet and ten inches in height, weighing one hundred and sixty-seven pounds. The lower half of the left thigh and the left knee measured from three to four inches more in circumference than the corresponding parts of the right limb. This difference was due to a hard, elongated swelling situated in the back of the thigh and leg. It was not attached to the overlying skin, but closely attached to the deep fascia. Its lower portion presented a distinct rounded outline; but the upper margin was lost beneath the deep muscles on the back of the thigh (Fig. 1). The whole tumor measured about sixteen

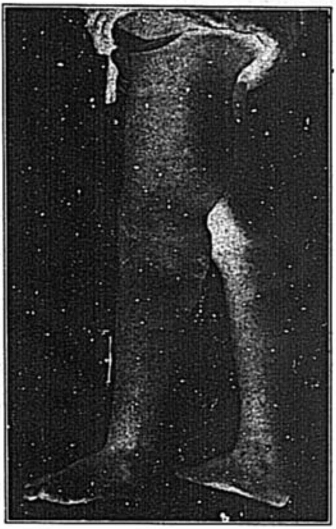

FIG. 1.—Fibrosarcoma of the deep fascia of the thigh and leg involving the sciatic nerve and some of its branches.